WHAT IS CLAIMED IS:

1. A method for determining one or more signal parameters for a tone in an input signal, the method comprising:

receiving samples of the input signal, wherein the input signal includes the tone;

generating a frequency transform of the samples;

identifying a frequency location proximate to an amplitude peak in the frequency transform, wherein the amplitude peak corresponds to the tone;

selecting two or more frequency bins proximate to the frequency location in the frequency transform; and

determining a tone frequency value that minimizes a difference between at least a first expression and a second expression;

wherein the first expression comprises a sum of two or more numerator terms divided by a sum of two or more denominator terms, wherein the first expression includes a tone frequency variable;

wherein each numerator term and each denominator term corresponds to one of the frequency bins; and

wherein the second expression comprises a sum of one or more of the numerator terms divided by a sum of one or more of the denominator terms, wherein the second expression includes the tone frequency variable;

wherein the tone frequency value comprises a frequency of the tone.

2. The method of claim 1,

wherein the tone frequency variable represents a correct tone frequency value of the tone; and

wherein the determined tone frequency value represents an approximation of the correct tone frequency value.

3. The method of claim 2,

wherein the first expression is approximately equivalent to the second expression when the correct tone frequency value is used for the tone frequency variable in the first and second expressions.

4. The method of claim 1,

wherein a ratio of each numerator term and its corresponding denominator term represent an amplitude of the tone at a respective bin.

5. The method of claim 1,

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin.

6. The method of claim 1,

wherein said determining a tone frequency value comprises:

computing a plurality of differences between the first expression and the second expression for different respective tone frequency values of the tone frequency variable; and

selecting the tone frequency value that produces a smallest difference.

7. The method of claim 6, wherein said computing a plurality of differences comprises performing a Newton-Rhapson root finding method.

8. The method of claim 1,

wherein the first expression and the second expression are each a complex expression.

9. The method of claim 8,

wherein said determining a tone frequency value that minimizes a difference between a first complex expression and a second complex expression comprises determining a tone frequency value that minimizes a difference between an amplitude of the first complex expression and an amplitude of the second complex expression

10. The method of claim 1, wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(F(n)W^*(f_n-f_i)-F^*(n)W(f_n+f_i)\right)}{\sum_{k+1}^{k+M}\left(\left|W(f_n-f_i)\right|^2-\left|W(f_n+f_i)\right|^2\right)}\right|=\left|\frac{\sum_{k+1}^{k+M-1}\left(F(n)W^*(f_n-f_i)-F^*(n)W(f_n+f_i)\right)}{\sum_{k+1}^{k+M-1}\left(\left|W(f_n-f_i)\right|^2-\left|W(f_n+f_i)\right|^2\right)}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

11. The method of claim 1,

wherein said generating a frequency transform of the samples comprises generating a power spectrum of the samples;

wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(\left|F(n)\right|\times\left|W(f_n-f_i)\right|\right)}{\sum_{k+1}^{k+M}\left|W(f_n-f_i)\right|^2}\right|=\left|\frac{\sum_{k+1}^{k+M-1}\left(\left|F(n)\right|\times\left|W(f_n-f_i)\right|\right)}{\sum_{k+1}^{k+M-1}\left|W(f_n-f_i)\right|^2}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

12. The method of claim 1, further comprising:

storing the determined tone frequency value in a memory.

13. The method of claim 1, further comprising:

outputting the determined tone frequency value.

14. The method of claim 1, further comprising:

computing one or more of the amplitude and phase of the tone using the determined tone frequency value.

15. The method of claim 1,

wherein at least one of the two or more frequency bins is on each side of the frequency location.

16. The method of claim 1,

wherein said identifying comprises identifying a frequency location of at least one first magnitude peak in the frequency transform; and

wherein said selecting comprises selecting two or more frequency bins proximate to the at least one first magnitude peak in the frequency transform;

17. The method of claim 1,

wherein the input signal comprises a plurality of tones; and

wherein the method operates to find signal parameters of a first tone of the plurality of tones.

18. The method of claim 1,

wherein the input signal comprises a plurality of tones; and

wherein said identifying, said selecting, and said determining are performed for each of the plurality of tones to determine at least one signal parameter for each of the plurality of tones in the input signal.

19. A method for determining one or more signal parameters for a tone in an input signal, the method comprising:

receiving samples of the input signal, wherein the input signal includes the tone;

operating on the samples to generate a frequency transform array;

identifying a frequency location of at least one first magnitude peak in the frequency transform array;

selecting two or more frequency bins in a neighborhood of the at least one first magnitude peak in the frequency transform array;

determining a tone frequency value that minimizes a difference between a first expression and a second expression;

wherein the first expression comprises a sum of two or more numerator terms divided by a sum of two or more denominator terms, wherein the first expression includes a tone frequency variable that represents a correct tone frequency value of the tone;

wherein each numerator term and each denominator term corresponds to one of the frequency bins; and

wherein the second expression comprises a sum of one or more of the numerator terms divided by a sum of one or more of the denominator terms, wherein the

second expression includes a tone frequency variable that represents the correct tone frequency value of the tone;

wherein the determined tone frequency value represents an approximation of the correct tone frequency value.

20. The method of claim 19,

wherein the first expression is approximately equivalent to the second expression when the correct tone frequency value is used for the tone frequency variable in the first and second expressions.

21. The method of claim 19,

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin.

22. The method of claim 19, further comprising:

storing the determined tone frequency value in a memory.

23. A method for determining signal parameters for a tone in an input signal, the method comprising:

receiving samples of the input signal, wherein the input signal includes the tone;

generating a frequency transform of the input signal;

identifying two or more frequency bins proximate to a first magnitude peak in the frequency transform; and

selecting a tone frequency value that makes a plurality of expressions most nearly equal;

wherein each of the plurality of expressions comprises a sum of one or more numerator terms divided by a sum of one or more denominator terms, wherein each of the plurality of expressions includes a tone frequency variable;

wherein each numerator term and each denominator term corresponds to one of the frequency bins; and

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin;

wherein the tone frequency value comprises a frequency value of the tone.

24. The method of claim 23,

wherein the tone frequency variable represents a correct tone frequency value of the tone;

wherein the determined tone frequency value represents an approximation of the correct tone frequency value.

25. The method of claim 24,

wherein the first expression is approximately equivalent to the second expression when the correct tone frequency value is used for the tone frequency variable in the first and second complex expressions.

26. The method of claim 23,

wherein said determining a tone frequency value comprises:

computing a plurality of differences between the first expression and the second expression for different respective tone frequency values of the tone frequency variable; and

selecting the tone frequency value that produces a smallest difference.

27. The method of claim 23,

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin.

28. The method of claim 23, wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(F(n)W^{*}(f_n - f_i) - F^{*}(n)W(f_n + f_i)\right)}{\sum_{k+1}^{k+M}\left(\left|W(f_n - f_i)\right|^2 - \left|W(f_n + f_i)\right|^2\right)}\right| = \left|\frac{\sum_{k+1}^{k+M-1}\left(F(n)W^{*}(f_n - f_i) - F^{*}(n)W(f_n + f_i)\right)}{\sum_{k+1}^{k+M-1}\left(\left|W(f_n - f_i)\right|^2 - \left|W(f_n + f_i)\right|^2\right)}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

29. The method of claim 23,

wherein said generating a frequency transform of the samples comprises generating a power spectrum of the samples;

wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(\left|F(n)\right| \times \left|W(f_n - f_i)\right|\right)}{\sum_{k+1}^{k+M}\left|W(f_n - f_i)\right|^2}\right| = \left|\frac{\sum_{k+1}^{k+M-1}\left(\left|F(n)\right| \times \left|W(f_n - f_i)\right|\right)}{\sum_{k+1}^{k+M-1}\left|W(f_n - f_i)\right|^2}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

30. The method of claim 23, further comprising:

storing the determined tone frequency value in a memory.

31. The method of claim 23, further comprising:

outputting the determined tone frequency value.

32. The method of claim 23, further comprising:

computing one or more of the amplitude and phase of the tone using the determined tone frequency value.

33. The method of claim 23, wherein the plurality of expressions include:

a first expression comprising a sum of one or more numerator terms divided by a sum of one or more denominator terms;

a second expression comprising a sum of at least two numerator terms divided by a sum of at least two denominator terms.

34. The method of claim 23, wherein the plurality of expressions include:

a first expression comprising a sum of two or more numerator terms divided by a sum of two or more denominator terms;

a second expression comprising a sum of three or more numerator terms divided by a sum of three or more denominator terms.

35. A memory medium comprising program instructions for determining one or more signal parameters for one or more tones in an input signal, wherein the program instructions are executable by one or more processors to implement:

receiving samples of the input signal, wherein the input signal includes the tone;

generating a frequency transform of the samples;

identifying a frequency location proximate to an amplitude peak in the frequency transform, wherein the amplitude peak corresponds to the tone;

selecting two or more frequency bins proximate to the frequency location in the frequency transform;

determining a tone frequency value that minimizes a difference between at least a first expression and a second expression,

wherein the first expression comprises a sum of two or more numerator terms divided by a sum of two or more denominator terms, wherein the first expression includes a tone frequency variable;

wherein each numerator term and each denominator term corresponds to one of the frequency bins;

wherein the second expression comprises a sum of one or more of the numerator terms divided by a sum of one or more of the denominator terms, wherein the second expression includes a tone frequency variable which represents a correct tone frequency value of the tone;

wherein the tone frequency value comprises a frequency of the tone.

36. The memory medium of claim 35,

wherein the tone frequency variable represents a correct tone frequency value of the tone;

wherein the determined tone frequency value represents an approximation of the correct tone frequency value.

37. The memory medium of claim 35,

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin.

38. The memory medium of claim 35, wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(F(n)W^{*}(f_n - f_i) - F^{*}(n)W(f_n + f_i)\right)}{\sum_{k+1}^{k+M}\left(\left|W(f_n - f_i)\right|^2 - \left|W(f_n + f_i)\right|^2\right)}\right| = \left|\frac{\sum_{k+1}^{k+M-1}\left(F(n)W^{*}(f_n - f_i) - F^{*}(n)W(f_n + f_i)\right)}{\sum_{k+1}^{k+M-1}\left(\left|W(f_n - f_i)\right|^2 - \left|W(f_n + f_i)\right|^2\right)}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

39. The memory medium of claim 35,

wherein said generating a frequency transform of the samples comprises generating a power spectrum of the samples;

wherein the first expression and the second expression have the form:

$$\left|\frac{\sum_{k+1}^{k+M}\left(\left|F(n)\right| \times \left|W(f_n - f_i)\right|\right)}{\sum_{k+1}^{k+M}\left|W(f_n - f_i)\right|^2}\right| = \left|\frac{\sum_{k+1}^{k+M-1}\left(\left|F(n)\right| \times \left|W(f_n - f_i)\right|\right)}{\sum_{k+1}^{k+M-1}\left|W(f_n - f_i)\right|^2}\right|$$

wherein:

F(n) is the *n*th value of the single sided scaled FFT spectrum; and

W represents a window function, wherein the window function is shifted by a value of the tone frequency variable f_i.

40. A memory medium comprising program instructions for determining one or more signal parameters for one or more tones in an input signal, wherein the program instructions are executable by one or more processors to implement:

receiving samples of the input signal, wherein the input signal includes the tone;

operating on the samples to generate a frequency transform array;

identifying two or more frequency bins proximate to a first magnitude peak in the frequency transform array;

determining a tone frequency value that minimizes a difference between a first expression and a second expression;

selecting a tone frequency value that makes a plurality of expressions most nearly equal;

wherein each of the plurality of expressions comprises a sum of one or more numerator terms divided by a sum of one or more denominator terms, wherein each of the plurality of expressions includes a tone frequency variable;

wherein each numerator term and each denominator term corresponds to one of the frequency bins;

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone.

41. A tone detection system, comprising:

an input for receiving samples of an input signal, wherein the input signal includes a tone;

a processor; an

a memory medium coupled to the processor, wherein the memory medium stores a tone detection software program for detecting the tone present in the input signal;

wherein the processor is operable to execute the tone detection software program to implement:

generating a frequency transform of the input signal;

identifying an amplitude peak in the frequency transform, wherein the amplitude peak corresponds to the tone;

selecting two or more frequency bins in a neighborhood of the amplitude peak in the frequency transform; and

determining a tone frequency value that minimizes a difference between at least a first expression and a second expression;

wherein the first expression comprises a sum of two or more numerator terms divided by a sum of two or more denominator terms, wherein the first expression includes a tone frequency variable;

wherein each numerator term and its corresponding denominator term corresponds to one of the frequency bins; and

wherein the second expression comprises a sum of one or more of the numerator terms divided by a sum of one or more of the denominator terms, wherein the second expression includes the tone frequency variable;

wherein the first expression is approximately equivalent to the second expression when the correct tone frequency value is used for the tone frequency variable in the first and second expressions;

wherein the tone frequency value comprises a frequency of the tone.

42. The tone detection system of claim 41,

wherein the tone frequency variable represents a correct tone frequency value of the tone; and

wherein the determined tone frequency value represents an approximation of the correct tone frequency value.

43. The tone detection system of claim 41,

wherein a ratio of each numerator term and its corresponding denominator term represent an amplitude of the tone at a respective bin.

44. The tone detection system of claim 41,

wherein a ratio of each numerator term and its corresponding denominator term represent a complex amplitude of the tone at a respective bin.